

## The Particle Model


Name: \_\_\_\_\_

Period: \_\_\_\_\_

In today's activity you will be exploring the nature of matter as it relates to describing it in terms of individual particles. We will focus on matter in three different states; solid, liquid, and gas. Be sure to focus on what the particles of matter are doing in each state and how changes in what they are doing occur.

- Go to the following website to complete this activity:

<http://www.bbc.co.uk/schools/ks3bitesize/science/>

- Choose Chemical and material behaviour
- Choose The particle model (  **Revise** )

As you work your way through this section answer the following questions;

### Solids

List some examples of solid matter.

STEEL, PLASTIC, WOOD ARE SOLID AT ROOM TEMP

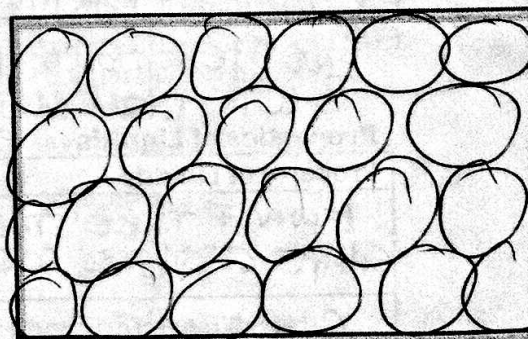
What characteristics do particles in a solid have?

- THEY ARE CLOSE TOGETHER
- ARRANGED IN A REGULAR PATTERN
- HELD TOGETHER BY STRONG FORCES CALLED BONDS
- VIBRATE IN A FIXED POSITION
- CANNOT MOVE FROM PLACE TO PLACE

Draw a diagram of the particles in a solid and describe their motion.

MOVING SLIGHTLY (VIBRATING IN PLACE)  
Do you think the forces holding the particles together are fairly strong, or very weak?

Strong - hold particles close and in place



### Properties of Solids

Property of Solid	Why they are like this:
FIXED SHAPE & CANNOT FLOW	PARTICLES CANNOT MOVE FROM PLACE TO PLACE
CANNOT BE COMPRESSED OR SQUASHED	PARTICLES ARE CLOSE TOGETHER AND HAVE NO SPACE TO MOVE



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## IMAGINE

Imagine that everyone in the room (your classmates) are each a particle of matter.  
How could we as a class simulate a solid?

(HINT: Describe how we would move and line up next to each other.)

LINE UP SHOULDER TO SHOULDER BACK TO FRONT AND SLIGHTLY WIGGLE IN PLACE

## Liquids

List some examples of liquid matter.

MERCURY, LEMONADE, WATER AT ROOM TEMP

Particles in liquids are:

- CLOSE TOGETHER
- ARRANGED IN A RANDOM WAY

Particles in a liquid can:

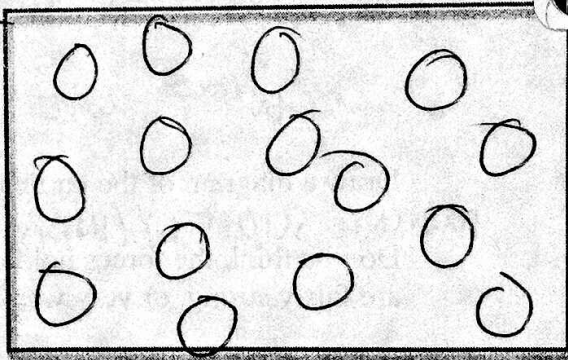
- MOVE AROUND EACH OTHER

Draw a diagram of the particles in a liquid and describe their motion.

MOVING AROUND - BOUNCING OFF EACH OTHER

Do you think the forces of attraction between the particles in a liquid compared to those in a solid?

BONDS ARE STRONG ENOUGH TO KEEP THE PARTICLES CLOSE TOGETHER BUT WEAK ENOUGH TO LET THEM MOVE AROUND EACH OTHER



## Properties of Liquids

Property of Liquids	Why they are like this:
FLOW + TAKE THE SHAPE OF THEIR CONTAINER	PARTICLES CAN MOVE AROUND EACH OTHER
CANNOT BE COMPRESSED OR SQUASHED	PARTICLES ARE CLOSE TOGETHER + HAVE NO SPACE TO MOVE IN

Imagine that everyone in the room (your classmates) are each a particle of matter.  
How could we as a class simulate a Liquid?

(HINT: Describe how we would move and line up next to each other.)

~~LINE UP SHOULDER TO SHOULDER BACK TO FRONT AND SLIGHTLY WIGGLE IN PLACE~~

6 INCHES APART FROM OTHER STUDENTS  
MOVING AROUND EACH OTHER



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## Gases

List some examples of gases.

AIR, HELIUM AND CHLORINE AT ROOM TEMP

The particles of a gas are:

- FAR APART
- ARRANGED RANDOMLY

Particles in a gas can:

- MOVE QUICKLY IN ALL DIRECTIONS

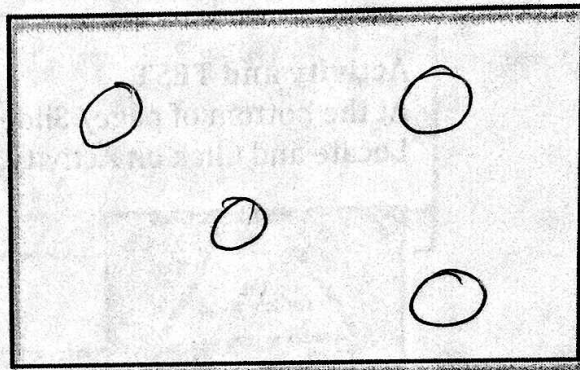
Draw a diagram of the particles in a gas and describe their motion.

MOVING FAST IN RANDOM PATTERNS

The forces of attraction in a gas are very, very, weak.

How does this weak attraction fit with the properties of a gas?

WHEN ATTRACTION IS  
WEAK PARTICLES  
CAN MOVE ABOUT  
FREELY



## Properties of a Gas

Property of a gas	Why they are like this:
FLOW AND COMPLETELY FILL CONTAINER	PARTICLES MOVE QUICKLY IN ALL DIRECTIONS
CAN BE COMPRESSED AND SQUASHED	PARTICLES ARE FAR APART + HAVE SPACE TO MOVE (2)

Imagine that everyone in the room (your classmates) are each a particle of matter.

How could we as a class simulate a gas?

(HINT: Describe how we would move and line up next to each other.)

ARM LENGTH APART MOVING ABOUT  
RANDOMLY

## Flowing:

Explain how a particular state of matter can flow or not flow using the particle model of matter

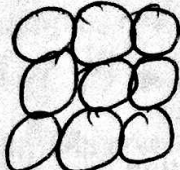
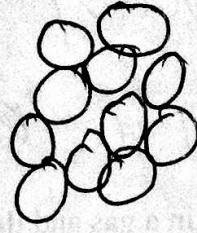
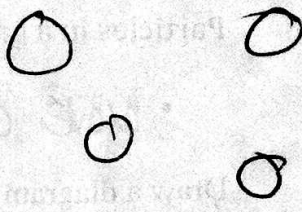
Solid: → PARTICLES VIBRATE - CAN'T MOVE PLACE TO PLACE - NO FLOW

Liquid: → PARTICLES SLIDE PAST ONE ANOTHER - FLOW

Gas: → PARTICLES MOVE FREELY IN ALL DIRECTIONS - FLOW



## Checkpoint (Review):

State	Solid	Liquid	Gas
Arrangement of particles	CLOSE	CLOSE	FAR
Movement of particles	PATTERN / VIBRATE IN ONE SPOT	RANDOM / MOVE AROUND EACH OTHER	RANDOM / MOVE IN ALL DIRECTIONS
Diagram			

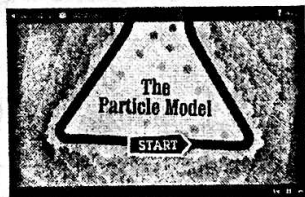
## Activity and TEST

At the bottom of page/ Slide #6  
Locate and Click on Activity.



## More from Particle model:

 Activity  Test



Watch it.

After you are done Click on Test.


Take it.

Click

**Check Score**

and record your score below:

The Particle Model Test: 7 / 7pts

- Go back to the Main page that we started on.
- Choose Chemical and material behaviour
- Choose Behaviour of Matter (  **Revise** )
- Select Expansion and contraction

## Expansion and Contraction

Briefly describe what happens to substances when they are heated and cooled.

COOLED - CONTRACT      HEATED - EXPAND

Why do engineers have to take into account this property of matter when building a bridge?

NEED SPECIAL JOINTS TO KEEP  
BRIDGES FROM BENDING OUT OF  
SHAPE IN THE HOT SUMMER



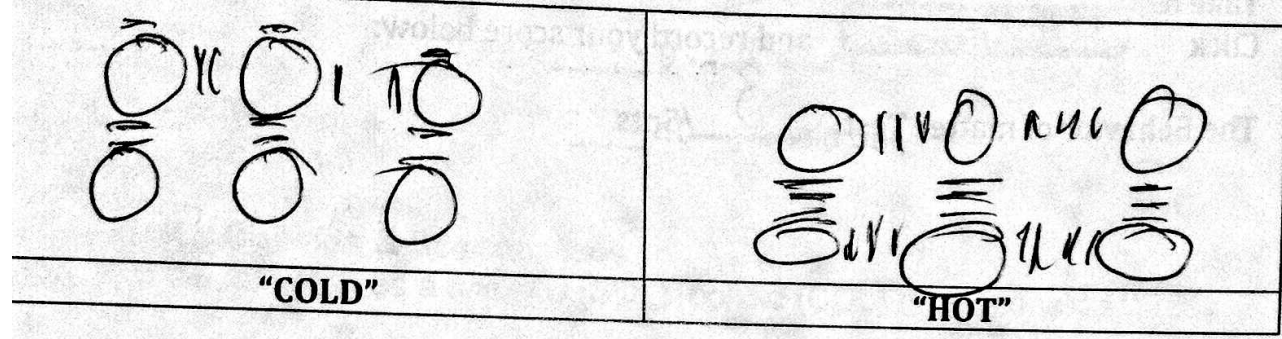
# What do the particles do?

Briefly describe what the particles of a substance are doing when they expand and contract.

- The particles in a solid: VIBRATE MORE WHEN HEATED
- The particles in a liquid: MOVE AROUND EACH OTHER MORE WHEN HEATED
- The particles in a gas: MOVE MORE QUICKLY IN ALL DIRECTIONS WHEN HEATED + TAKE UP MORE SPACE

Draw the particles of a solid in the boxes below when they are "cold" and "hot"...

## Expansion in Solids:



## Pressure in Gases:

Explain how a gas exerts pressure on the walls of the container it is in using the particle model.

THE MORE PARTICLES HIT THE WALL, THE HIGHER THE PRESSURE

(Using the particle model)

Explain why the pressure that a gas exerts in its container increases as it is heated.

AS A GAS IS HEATED PARTICLES MOVE FASTER & HIT THE CONTAINER'S WALL MORE OFTEN

## Diffusion:

Give an example of diffusion:

SMELLS OF FOOD COOKING IN THE KITCHEN

How does the particle model for matter help us explain the phenomenon?

WHEN PARTICLES FROM SOMETHING LIKE PERFUME OR FOOD GET LOOSE IN A ROOM - THE PARTICLES MIX WITH AIR PARTICLES AND ARE FREE TO MOVE ABOUT THE WHOLE ROOM

How does the rate of diffusion compare between solid, liquid, and gas?

(Explain this using the particle model!)

- GAS IS FASTER THAN LIQUID BECAUSE IN A LIQUID THE PARTICLES ARE STILL "BONDED" TOGETHER MAKING IT HARDER FOR THEM TO MOVE AROUND.
- DIFFUSION DOES NOT HAPPEN IN SOLIDS BC PARTICLES DO NOT MOVE AROUND



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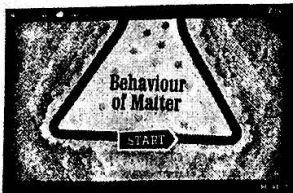
Period: \_\_\_\_\_

### Activity and TEST

At the bottom of page/ Slide #4  
Locate and Click on Activity.

### More from Behaviour of matter


⚙️ Activity ✎️ Test



Watch it.

After you are done Click on Test.

Take it.

Click  and record your score below:

The Behavior of matter Test: 8 /5pts